OCCASIONAL PAPERS

Museum of Texas Tech University

Number 250 20 January 2006

RESULTS OF A MAMMAL SURVEY OF THE TANDAYAPA VALLEY, ECUADOR

THOMAS E. LEE, JR., JAY B. PACKER, AND DIEGO ALVARADO-SERRANO

ABSTRACT

A mammal survey was conducted of the Tandayapa Valley, Pichincha, Ecuador. The Tandayapa Valley is located on the western slope of the Andes (0°00'13"N, 78°40'70"W). The ecosystem of the survey area is subtropical cloud forest. Sherman traps, pitfall traps, and mist nets were used to collect the specimens. Nineteen species of mammals were collected from the survey area (and two additional species were observed). Among the specimens collected were eight species (*Marmosops impavidus, Cryptotis equatoris, Micronycteris megalotis, Dermanura rava, Platyrrhinus dorsalis, Vampyressa thyone, Myotis keaysi,* and *Neusticomys monticolus*) that had not been recorded for this location and three species (*Carollia castanea, Vampyressa thyone,* and *Neusticomys monticolus*) that represented new elevation records of their species. Shannon-Wiener diversity analyses were performed for the overall mammalian diversity and the bat diversity, and the values were compared to other nearby locations.

INTRODUCTION

The Tandayapa Valley is located on the western slope of the Andes, 60 km northwest of Quito, Pichincha, Ecuador. The valley has a north/south axis that bisects the Equator. This study was conducted from 23 July to 17 August 2003. Although the Tandayapa Valley has been surveyed for birds many times (Ridgely and Greenfield 2001) it has been missed by mammal studies that were conducted close to this location (Jarrín and Fonseca 2001; Fonseca and Jarrín 2001; Fonseca et al. 2003; Tirira 1999). The surveyed ecosystem is subtropical cloud forest of the western Andes (Ridgely and Greenfield 2001). The mountains along the valley are steeply sloped and landslide- caused disturbance events appear to be common. Almost all the large plants (palms, tree ferns [*Cyathea* sp.], cecropia, strangler figs, and many large hardwoods) in the forest have epiphytic vascular plants (mostly *Tillandsia* sp.) and mosses on them. The forest floor is an assemblage of fungi, ferns, lycopods, vines, and young hardwood trees. There are patches of cattle pastures and orchards. Two streams run the length of the valley and down slope from our study site other streams merge from other valleys and the mountains. No caves were found near our site which may impact bat species diversity. At the time of this survey, there was an oil pipe line under construction near the upper elevations of the valley.

The focus of this survey was a mountain cloud forest between 1500 to 2100 m in elevation and within a 2 km radius of our main camp at 0°00'13"N, 78°40'70"W. Most of the bats were collected over a small (8 m by 2 m) water tank impoundment in the forest. The forest near the impoundment was old growth cloud forest.

MATERIALS AND METHODS

Sherman traps were set along hiking trails on the forest floor, in trees, in streams, and along stream banks. Bats were caught using mist nets over natural streams and over hiking trails. Pitfall traps were set in fields and along stream banks. All voucher specimens (skins, skulls and skeletons) were deposited in the Abilene Christian University Natural History Collection (ACUNHC) and Sección Mastozoología - Museo de Zoología Pontificia Universidad Católica del Ecuador (QCAZ). All frozen tissues collected from the survey were deposited in the ACUNHC. A Shannon-Wiener Index was calculated using the formula $H^p = n\log n - f_1\log f_1/n$ for the purpose of comparing the diversity of the Tandayapa Valley with other nearby sites. The records and the identifications of the mammals presented in this paper were checked against specimens in the Sección Mastozoología - Museo de Zoología, Pontifica Universidad Catolica del Ecuador. Some specimens that were of problematic identification were examined by other researchers of Neotropical mammals.

RESULTS AND SPECIES ACCOUNTS

Presented in these results are a number of new records for the Tandayapa Valley. Many of our specimens represent records in either range or elevation that had not previously been reported. We are not suggesting that these records are the result of new invasions by mammal species into the Tandayapa Valley. We suggest the new records reported here are examples of species that have been missed by previous sampling efforts. The survey is important because there have been many surveys close to the Tandayapa Valley, but few in that location itself (Albuja 1999; Jarrín and Fonseca 2001; Fonseca and Jarrín 2001; Fonseca et al. 2003; Tirira 1999).

The Tandayapa Valley was found to have a comparable level of chiropteran diversity as other nearby sites (Guajalito and Otonga) with a Shannon-Wiener diversity index value of $H^p = 0.88$. The overall mammalian diversity was $H^p = 0.99$. The species are arranged below in taxonomic order that follows Wilson and Reeder (1993).

Order Didelphimorphia
Family Didelphidae
Highland Mouse Opossum
Marmosops impavidus (Tschudi 1844)

A single specimen (ACUNHC 942) was salvaged from a forest trail. The vegetation on either side of the trail where the specimen was found was a disturbed thicket. The site was not far (< 100 m) from a bird lodge hotel. Both large and small didelphids have been observed on the hotel grounds feeding on trash and in the bird feeders. The range of *M. impavidus* in Ecuador is not well documented (Eisenberg and Redford 1999; Tirira 1999). Since most of the records are from southern Ecuador, this specimen is a important record for the north. Only one other species of opossum, a *Didelphis* sp., was observed in the forest.

Order Insectivora
Family Soricidae
Ecuadorian Least Shrew
Cryptotis equatoris (Thomas 1912)
Synonym: *C. thomasi*

A single female specimen (QCAZ/TEL 1433) was collected in a pitfall trap. The trap was located in a dry wash that contained a thicket of vegetation and was adjacent to a house and a field. All of these habitats were disturbed by humans. Although the pitfalls remained out for 300 trap nights no other shrews were caught, which may indicate that they are rare in this area. This is the first record from the Tandayapa Valley for any shrew (Eisenberg and Redford 1999; Tirira 1999).

Order Chiroptera
Family Phyllostomidae
Common Big-eared Bat
Micronycteris megalotis (Gray 1842)

A single male specimen (QCAZ/TEL 1533) was caught in a net that was over a forest trail. Near this net were large old growth trees. One of these trees was a strangler fig that provided many holes for roost sites. The elevation at this point was 2000 m. *Micronycteris megalotis* is known in the tropics and subtropics of the eastern slope and tropics of the western slope of the Andes (Albuja 1999; Tirira 1999; Jarrín and Fonseca 2001). However, most of the records are from south of the equator and there are none from the Tandayapa Valley.

Minor Hairy-Legged Long-Tongued Bat
Anoura caudifer (E. Geoffroy 1818)

Four individuals of *A. caudifer* were collected at four different locations within the study site. Two specimens (ACUNHC 888 and QCAZ/TEL 1416) were caught over a human-constructed impoundment water tank (elevation 1750 m). One of these specimens was a female with a 10 x 13 mm embryo. The other specimen caught at the impoundment was a male. A second male specimen (QCAZ/TEL 1475) was caught over a stream just 40 m from the water tank with similar habitat as the first. The fourth specimen (ACUNHC 887) was caught over a stream at about 1800 m in elevation. This specimen was a female with one embryo. This species previously has been collected from a location near our sites and these specimens are within the recorded elevation range (Patterson et al. 1996; Albuja 1999; Jarrín and Fonseca 2001).

Common Hairy-Legged Long-Tongued Bat
Anoura geoffroyi (Gray 1838)

Two female specimens (ACUNHC 894 and QCAZ/TEL 1432) of *A. geoffroyi* were collected in a net that was placed two meters above a stream (measured from the base). The net was located at 0°00'18"N and 78°41'00"W and about 1760 m in elevation. Both specimens were females and neither had embryos. This species previously has been collected from a location near our site and these specimens are within the recorded elevation range (Patterson et al. 1996; Albuja 1999).

Chestnut Short-Tailed Fruit Bat
Carollia castanea (H. Allen 1890)

Twelve specimens (ACUNHC 882, 895-897, 926, 927, QCAZ/TEL 1424, 1443, 1470, 1489, 1495, 1507) (six males and six females) were collected from the Tandayapa Valley. These specimens were collected in a variety of habitats including fields, over streams, pools, secondary forests and old growth forests. The body size of these specimens was highly variable (total length 66-78 mm and forearm 36-41mm) but all of these specimens have flat low cusps on the first lower molar that separates this species from other *Carollia* (Pine 1972). These specimens were all collected at locations around 1700 m, 600 m above the recorded elevation levels (Patterson et al. 1996). This species previously has been collected near the Tandayapa Valley (Albuja 1999).

Pygmy Fruit-Eating Bat
Dermanura rava (Thomas 1893)
Synonym: *Artibeus phaeotis* Miller 1901

Seven *Dermanura rava* (ACUNHC 885, 886, 890, 891, QCAZ/TEL 1427, 1484, 1492) were netted in two locations. Six individuals (three males and three females) were caught over the impoundment water tank, and one (a female) was caught over a trail through old growth forest. Most of the individuals collected in this study had distinct facial stripes, but one did not. The total length ranged from 58-64 mm and the forearm was 39-44 mm. No specimen of this species has been recorded in the Tandayapa Valley (Albuja 1999). The closest record is from Río Umachaca 25 km to the east of the valley. Our identification of these specimens was confirmed by Bruce Patterson (New Mexico State University) and Sergio Solari (Texas Tech University).

Thomas's White-Lined Fruit Bat
Platyrrhinus dorsalis (Thomas 1900)

Three *Platyrrhinus dorsalis* were found on this site. Two (QCAZ/TEL 1415, 1434) were caught over the impoundment water tank and one (ACUNHC 884) in higher old growth forest. All three of these specimens were females with one embryo each. These specimens all had clearly visible buff-colored facial stripes and a bright dorsal stripe. This color pattern probably rules out that these specimens are *P. chocoensis* (Ferrell and Wilson 1991; Tirira 1999, 2001). The range of *P. dorsalis* is not well documented in Ecuador (Albuja 1999). There are no records from the Tandayapa Valley and only two from the western Andean subtropical ecosystem of Ecuador. The closest records are from 30 km to the north of the Tandayapa Valley and 30 km to the south (Albuja 1999). These specimens are well within the elevation range for the species (Patterson et al. 1996).

Andean Yellow-Shouldered Fruit Bat
Sturnira bidens (Thomas 1915)

Two specimens (ACUNHC 929 and 930), a male and a female, were caught at the impoundment water tank. These specimens were caught at 1750 m which is 150 m lower than previously reported (Patterson et al. 1996). There are records within 20 km of the Tandayapa Valley for this species (Albuja 1999).

Dark Yellow-Shouldered Fruit Bat
Sturnira erythromos (Tschudi 1844)

Sixteen individuals (ACUNHC 878, 928, 931, 932, 934, 935, 937, QCAZ/TEL 1429, 1439, 1440, 1456, 1487, 1488, 1500, 1523, 1528) (eight males and eight females) were caught in many habitats within the study site area. All of these specimens were dark brown to black in color with gray underfur. One specimen had a single embryo. There are records of this species from near our collecting site, and it is within the recorded elevation range for the species (Patterson et al. 1996; Albuja 1999).

Western Yellow-Shouldered Fruit Bat
Sturnira ludovici (Anthony 1924)

Thirty individuals (ACUNHC 879-881, 892, 893, 904-913, 933, 936, QCAZ/TEL 1419, 1422, 1436, 1455, 1457, 1458, 1460, 1462, 1463, 1486, 1501, 1510, 1522) were caught in all of the habitats examined in this study. Twenty-one were females and of these three had embryos. Four of the nine males caught were rusty colored on the ventral surface, four were light gray, and one was immature. There are nearby records from about 10 km west of our site for this species. These specimens were collected (1750-1850 m) close to the upper limits (2000 m) in elevation for this species (Reid 1997).

Common Yellow-Eared Bat
Vampyressa thyone (Wagner 1843)
Synonym: *V. pusilla* Thomas 1909

A single specimen (ACUNHC 883), a female with an embryo, was caught in a net over the impoundment water tank. There are no previous records from the Tandayapa Valley. The elevation was 1750 m, 750 m higher than other known specimens (Patterson et al. 1996). This is significant because this elevation places this specimen of *V. thyone* outside of the lowland tropi-

cal zone where most specimens have been obtained (Albuja 1999). However, Albuja (1999) states that *V. pusilla* (*V. thyone*) is known from all the ecosystems of Ecuador except the Paramo of the high Andes. Nevertheless, it has not been recorded from the nearby sites with similar elevation of Guajalito and Otonga (Jarrín and Fonseca 2001). The nearest range records are 15 km west of the Tandayapa Valley (Albuja 1999).

Common Vampire Bat
Desmodus rotundus (E. Geoffroy 1810)

A single male specimen (ACUNHC 889) was caught in a net over the impoundment water tank. This was not the ideal habitat for this species compared to pastures with large domestic mammals. We placed nets in and near cattle ranches, and no vampires were caught. There is one record within 15 km of our site for this species (Albuja 1999).

Family Vespertilionidae
Hairy-Legged Myotis
Myotis keaysi (Allen 1914)
Synonym: *M. pilosotibialis*

Eight specimens (four males and four females; ACUNHC 901-903, QCAZ/TEL 1421, 1425, 1426, 1532, 1544) were collected. Six of these specimens were caught at the water tank impoundment and two were caught higher (1800 m) over a forest trail. This species has never been recorded from the Tandayapa Valley. Moreover, there are no records in northern Ecuador (Albuja 1999). There are only four records, three from the southern third of Ecuador in the subtropical western Andean ecosystem and one from the north (Albuja 1999; Jarrín and Fonseca 2001). These specimens were all caught well within the elevation range (Patterson et al. 1996).

Black Myotis
Myotis nigricans (Schinz 1821)

Three female specimens (ACUNHC 925, QCAZ/TEL 1506, 1509) were caught over a creek that was at the lowest elevation point (1500 m) in this study. One of the individuals was lactating. This elevation is within the range reported from the Manu Biosphere Reserve, Peru (Patterson et al. 1996) and range records indicate that this species has been collected in this location previously (Albuja 1999).

Order Carnivora
Family Felidae
Oncilla
Leopardus tigrinus (Schreber 1775)
Synonym: *Felis pardinoides*

A single specimen (QCAZ/TEL 1449) was salvaged from a villager. The village in the Tandayapa Valley is bordered by a road, the forest, and a stream. The site was not far (< 1000 m) from a bird lodge hotel. Some bird guides had seen the cat alive the day it was given to us. It appeared to be a malnourished subadult male. This individual was striped, not the normal spotted pattern (Reid 1997). This species has been recorded for Pichincha and in all the ecosystems of Ecuador except the Paramo (Tirira 1999, 2001). However, this is an important record because of the rarity of oncilla in all of the ecosystems of Ecuador. The only other member of the order Carnivora seen during this study was a kinkajou (*Potos flavus*).

Order Rodentia
Family Muridae
Tiny Rice Mouse
Microryzomys minutus (Tomes 1860)

Four individuals of *M. minutus* (ACUNHC 898, 899, QCAZ/TEL 1481, 1482) were collected. Some of the specimens had patches of white pelage around the face. Interestingly, all three males were collected on the same day, 5 August, while the one female was collected on 13 August 2003. These specimens are within the recorded range, at 1700 m. However, most specimens are found around 1900 m and these animals were at the lowest limits of their elevation range (Eisenberg and Redford 1999). Although no temperature readings were taken during this study, it was noticeably colder on the two days we collected *M. minutus*.

Mountain Water Rat
Neusticomys monticolus (Anthony 1921)

Two individuals, a male and female (ACUNHC 900, QCAZ/TEL 1541), were caught with Sherman traps placed in a forested mountain stream. As described by Tate (1931), our specimens were taken near a small waterfall and the traps were exposed to the spray of water from the fall. There are no records of this species from the northern subtropical (north of the equator) ecosystem of Ecuador (Eisenberg and Redford 1999; Tirira 1999; Voss1988). These specimens represent a low elevation record in Ecuador. A GPS reading was not possible in this location because the forest canopy was too thick, and the stream was in a box canyon. However, an estimate of the location and elevation of this site (based on other nearby sites) was 0°00'09"N, 78°41'30"W, and 1,850 m in elevation. Voss (1988) documented *N. monticolus* in Ecuador between 2,245 and 2,290 m. The Voss (1988) specimens from Ecuador were found in three locations: San Ignacio, Guarumal, and Papallacta. In Colombia four specimens have been found between 1800 and 1900 m. However, these Colombian specimens differ in skull morphology from Ecuadorian samples (Voss 1988).

Montane Rice Rat
Oryzomys albigularis (Tomes 1860)

Thirty-two specimens (ACUNHC 914-924, 938-941, 950, QCAZ/TEL 1450, 1451, 1459, 1461, 1467, 1468, 1473, 1477, 1480, 1496, 1497, 1499, 1513, 1518, 1520, 1525) were collected in all the elevation levels sampled. Most of the specimens were found along streams or near springs. Some that were collected away from open water were found near rotten vegetation. There were 22 males and 10 females collected. None of the females had embryos. All the specimens (except one juvenile) had a dark reddish- brown back and a gray to buffy belly and throat.

DISCUSSION

The chiropteran community of the Tandayapa Valley is similar to that of nearby Guajalito and Otonga (Jarrìn and Fonseca 2001). Both Guajalito and Otonga are close to the same elevation range and both are a part of the same ecosystem that was covered in the study of the Tandayapa Valley. In this study we found 13 species of bat for the Tandayapa Valley, while Guajalito has 16 species recorded and Otonga has 18 species. The Shannon-Wiener index of diversity was $H^p = 0.88$ for the Tandayapa Valley which is slightly lower than the $H^p = 1.03$ for Guajalito and $H^p = 1.02$ for Otonga (Jarrín and Fonseca 2001). It should be noted that we changed the values of Jarrín and Fonseca (2001) to logarithmic values to compare our data.

Fifty-six percent of the bat species from Guajalito were shared with Tandayapa whereas 44 percent of the species from Otonga were shared with Tandayapa. This similarity is to be expected because Otonga (0°25'S, 79°00'W) in the state of Cotopaxi, is further from Tandayapa than Guajalito. Tandayapa, like Guajalito, is in northern Pichincha. Members of the genus *Sturnira* were the most common (greater than 20 captures) at all three sites (Jarrín and Fonseca 2001). However, *S. ludovici* was the most common at Tandayapa and Guajalito, whereas *S. bidens* was the most common at Otonga and *S. bidens* was rare at Tandayapa. Otonga not only had the highest diversity in terms of actual numbers of species, but it had more bat families as well. Those bat families found at Otonga and not found at the other two sites were represented by two species of molossidae and one species of emballonuridae (Jarrín and Fonseca 2001). All three locations had members of the families Phyllostomidae and Vespertilionidae.

In conclusion, although we seemed to have collected a comparable sample of the bat species from the Tandayapa Valley, we were unable to collect many representatives of other mammalian orders. For example, with the exceptions of the oncilla and the kinkajou, carnivores and other taxa of large mammals were not encountered on this survey because they are probably rare. However, we did interview bird guides and ecotourist lodge owners who said that they had

seen the following within the last two years: spectacled bear (*Tremarctos ornatus*), jaguarundi (*Herpailurus yaguarondi*), and pudu (*Pudu mephistophiles*).

Although land preservation in the Tandayapa Valley has become more prevalent as the ecotourism industry has expanded, the area continues to receive environmental pressure from oil pipeline development and deforestation. These pressures are especially strong in the upper elevations of the Tandayapa Valley. Therefore it is critical that surveys like this study continue in this northwestern region of Ecuador.

ACKNOWLEDGMENTS

This research was supported by a grant from the Abilene Christian University Math/Science Research Council. For help with permits and logistics we thank Bob Dowler, Santiago Burneo, Iain Campbell, and the staff of the Tandayapa Bird Lodge. Drafts of this paper were reviewed by Pebbles Lee and Jim Nichols.

LITERATURE CITED

Albuja, V. L. H. 1999. Murciélagos del Ecuador. 2nd edición. Senacyt y Fundacyt, Escuela Politécnica Nacional, Cicetrónic Cia. Ltda, Quito, Ecuador.

Eisenberg, J. F., and K. H. Redford. 1999. Mammals of the Neotropics, the Central Neotropics. The University of Chicago Press, Chicago.

Ferrell, C. S., and D. E. Wilson. 1991. *Platyrrhinus helleri*. Mammalian Species 373:1-5.

Fonseca, R. M., and P. Jarrín-V. 2001. Patrones reproductivos de las comunidades de murciélagos en dos bosques de las estribaciones noroccidentales de los Andes ecuatorianos. Pp. 365-374 in: Epiphytes and Canopy Fauna of the Otonga Rain Forest (Ecuador). Results of the Bonn - Quito Epiphyte Project, Vol. 2 (J. Nieder and W. Barthlott, eds.). Botanisches Institut der Universitat Bonn, Germany.

Fonseca, R. M., J. P. Carrera-E., T. Enríquez, D. O. Lasso, C. M. Pinto, J. S. Tello, and J. N. X. Viteri. 2003. Identificación preliminar de un corredor ecológico para mamiferos entre los parques nacionales Llanganetes y Sangay. Revista de la Pontificia Universidad Catolica del Ecuador 71:201-216.

Jarrín-V., P., and R. M. Fonseca. 2001. Composición y estructura de la comunidad de murciélagos en dos bosques nublados de las estribaciones occidentales de los Andes. Pp. 335-364 in: Epiphytes and Canopy Fauna of the Otonga Rain Forest (Ecuador). Results of the Bonn - Quito Epiphyte Project, Vol. 2 (J. Nieder and W. Barthlott, eds.). Botanisches Institut der Universitat Bonn, Germany.

Patterson, B. D., V. Pacheco, and S. Solari. 1996. Distribution of bats along an elevation gradient in the Andes of south-eastern Peru. Journal of Zoology, London 240:637-658.

Pine, R. H. 1972. The bats of the genus *Carollia*. Texas A&M University Press, College Station, Texas.

Reid, F. A. 1997. A field guide to the mammals of Central America and Southeast Mexico. Oxford University Press, New York.

Ridgely, R. S., and P. J. Greenfield. 2001. The birds of Ecuador. Cornell University Press, New York.

Tate, G. H. H. 1931. Random observations on habits of South American mammals. Journal of Mammalogy 12:248-256.

Tirira, D. S. 1999. Mamíferos del Ecuador. Publicación Especial 2, Museo de Zoología, Centro de Biodiversidad y Ambiente. Pontificia Universidad Católica del Ecuador, Simbioe, Quito, Ecuador.

Tirira, D. S. 2001. Libro rojo de los mamíferos del Ecuador. Simbioe.

Voss, R. S. 1988. Systematics and ecology of ichthyomyine rodents (Muroidea): patterns of morphological evolution in a small adaptive radiation. Bulletin of the American Museum of Natural History 188:259-493.

Wilson, D. E., and D. M. Reeder. 1993. Mammal species of the World, a taxonomic and geographic reference. Smithsonian Institution Press, Washington, D. C.

ERRATA for: Lee, Jr., T. E., J. B. Packer, and D. Alvarado-Serrano. 2006. Results of a mammal survey of the Tandayapa Valley, Ecuador. Occasional Papers, Museum of Texas Tech University 250:1-8.

Page 4, paragraph 1, lines 13-14: change **New Mexico State University** to **The Field Museum, Chicago**

Page 6, paragraph 3, line 3: change **JarrÌn** to **Jarrín**